

Screening of the National Blood Supply for West Nile Virus — United States, 2003

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West Nile Virus and Blood

- **Prior to 2002, no documented flavivirus transfusion transmission (except HCV)**
- **Biggerstaff and Petersen WNV paper, 2002**
Theoretical possibility of transfusion transmission
 - **Approximately 80% of infections asymptomatic**
 - **Period of viremia**
 - **Prevalence of viremia in affected population**

WNV Transfusion-Associated Transmission (TAT), 2002

- **61 investigations in 2002 (NEJM, 9 / 25 / 03)**
 - **23 confirmed TAT infections**
 - **16 infectious unit donors identified**
- **Transmitted in RBCs, plasma, & platelets**
- **Donations collected July 22 – October 6**

WNV Transfusion-Associated Transmission (TAT), 2002

- All infectious donations negative for WNV IgM
- Detected viremia in plasma 0.8 – 75.1 plaque forming units (pfu)/mL
 - Lower limit of detection 0.1 WNV pfu/mL
(for 500 μ L sample)

IND WNV Blood Screening, 2003

- **Risk of WNV transfusion transmission**
 - Proven during 2002
 - Repeated WNV epidemics expected
- **FDA investigational new drug (IND) mechanisms for rapid implementation of experimental screening tests by summer 2003**
- **WNV commercial screening tests**
 - Minipool format (same as HCV, HIV, and HBV)
 - Nucleic acid amplification tests (NAT)

IND WNV Blood Screening Algorithm

6 or 16 member
minipool

Pool is negative
(non-reactive)

Release product

Pool is Reactive

Test pool members
individually

Individual test negative

Release product

Individual test reactive

Re-test individually or test alternate sample

Individual test reactive OR non-reactive on repeat testing

- Destroy product
- Test by IgM / IgG ELISA and alternate NAT
- Donor deferral and Follow-up (NAT & IgM / IgG ELISA)

IND WNV Blood Screening Algorithm

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Individual test reactive = **Presumptive viremic donor
(PVD)**

Reported to health department and to CDC

2003 WNV PVD Surveillance

Weekly AABB conference call (“AlterNET”)

- FDA, AABB, DoD, CDC
- Represented 90-95% U.S. donors
- Number of tests & results by state, PVDs
- Results of special studies
 - Retrospective testing of minipool screen-negative donations
 - Prospective individual donation testing in areas of high NAT yield

2003 WNV PVD Surveillance

- **Blood banks reported PVDs directly to public health departments**
- **ArboNET**
 - **Continuous, web-based reporting:**
 - **PVDs**
 - **WNV-infected blood donors & recipients**
 - **Clinical follow-up**
 - **Demographics**

PVDs Reported to “AlterNET”*

- **Reports of 1,027 PVDs collected from large blood testing groups and DoD**
- **Total of more than 6.2 million donations screened**
- **Last PVD reported 12 / 2 / 2003 from Georgia**

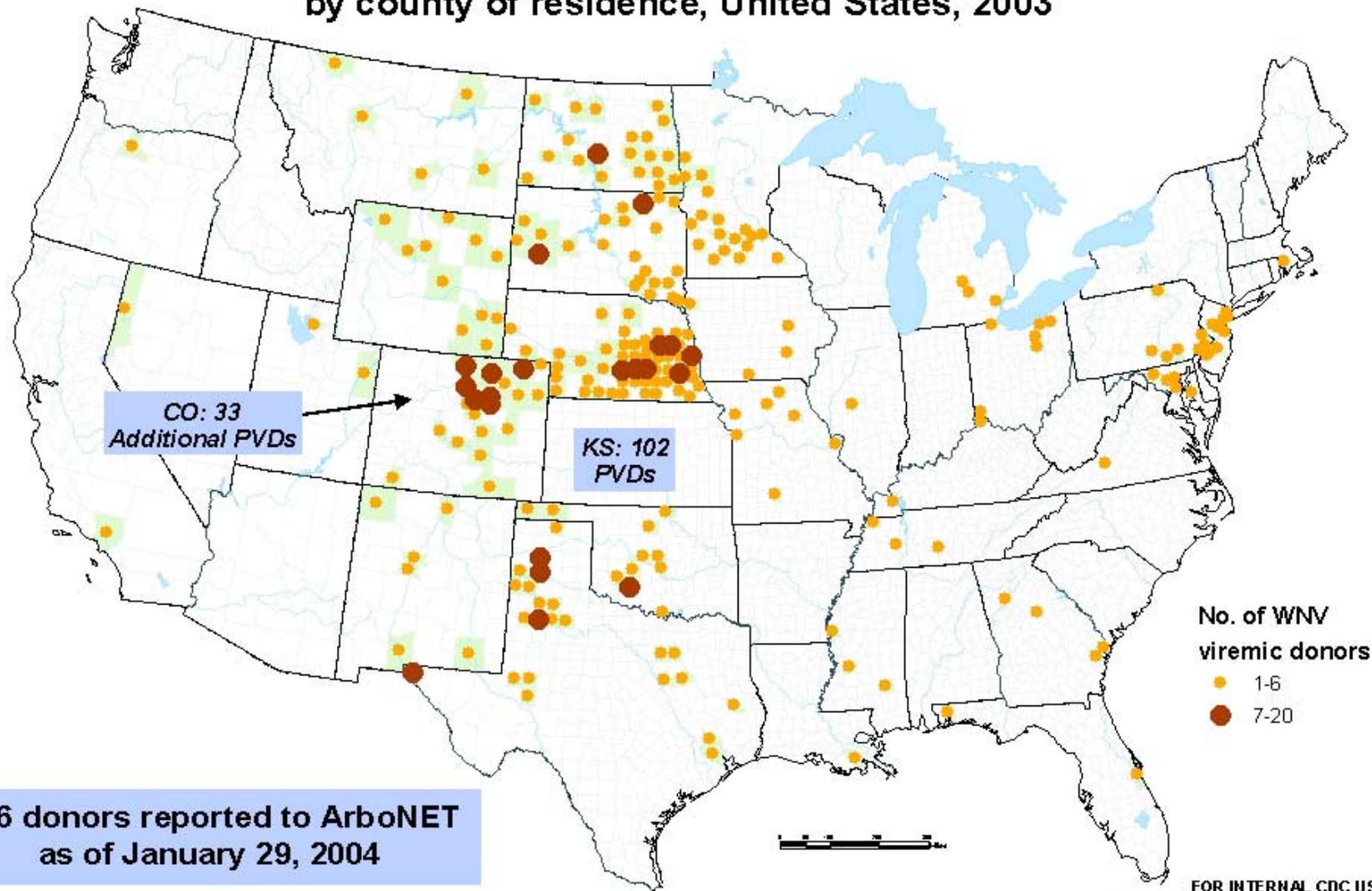
*** Reported as of 1 / 21 / 2004**

PVDs Reported to ArboNET*

- 806 PVDs reported to ArboNET
- Information for 671 PVDs:
 - 6 (1 %) develop WNND, median age 45 years (range: 28 - 76 years)
 - 99 (15 %) develop WNF
- 691 (86 %) of reported PVDs from 9 states:
CO, KS, NE, NM, ND, OK, SD, TX, WY

* Reported as of 1 / 29 / 2004

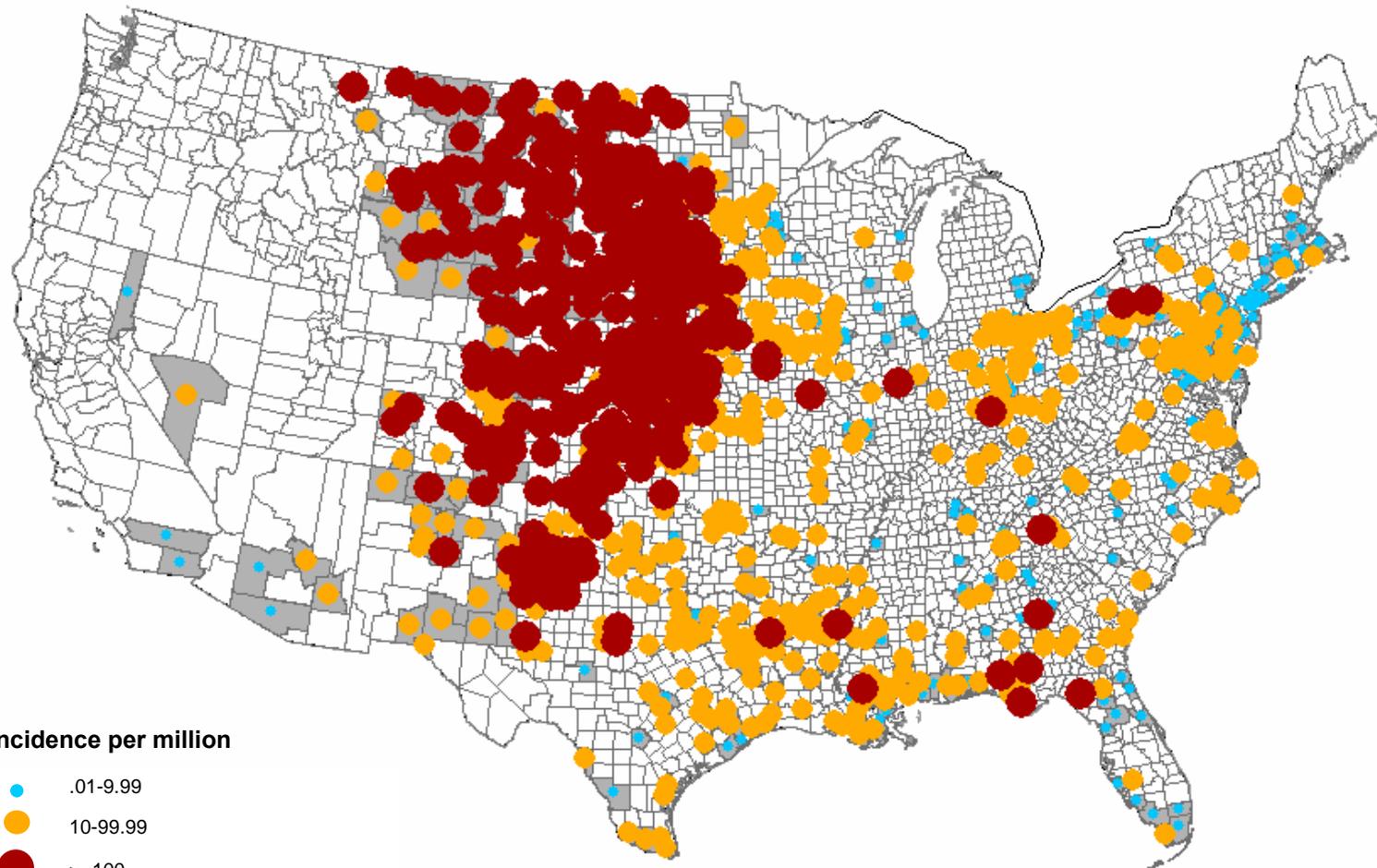
West Nile viremic blood donors,* by county of residence, United States, 2003



* Reported to CDC/ArboNET by state and metropolitan health departments. Reports are presumptive and confirmatory investigations may be ongoing. Some viremic donors known to the blood banks and health departments may not be reported here. For more summary information on reported viremic blood donors, go to the MMWR online at <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5232a3.htm>.

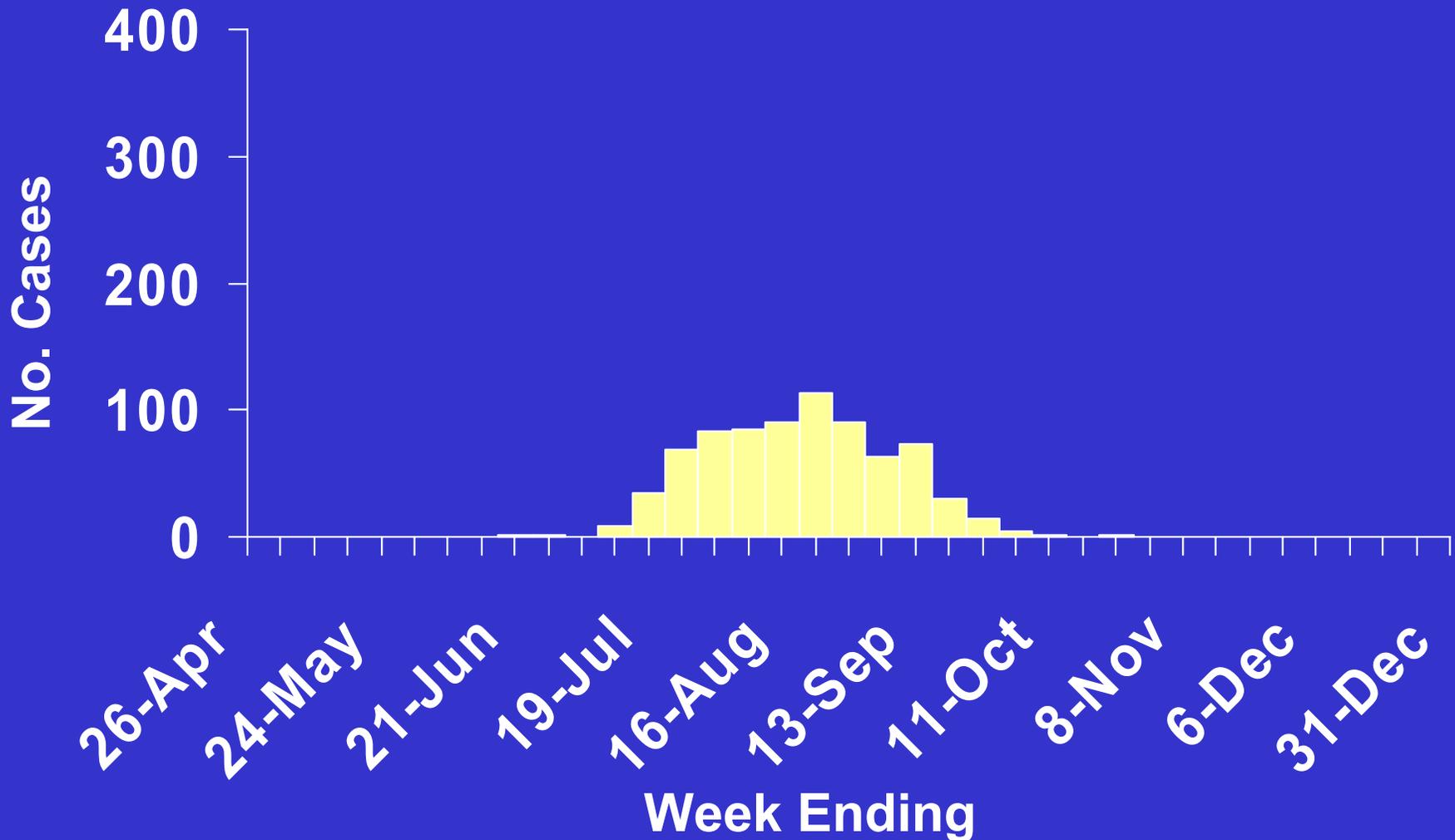


West Nile Virus Neuroinvasive Disease (WNND) County Level Incidence per Million, U.S., 2003*



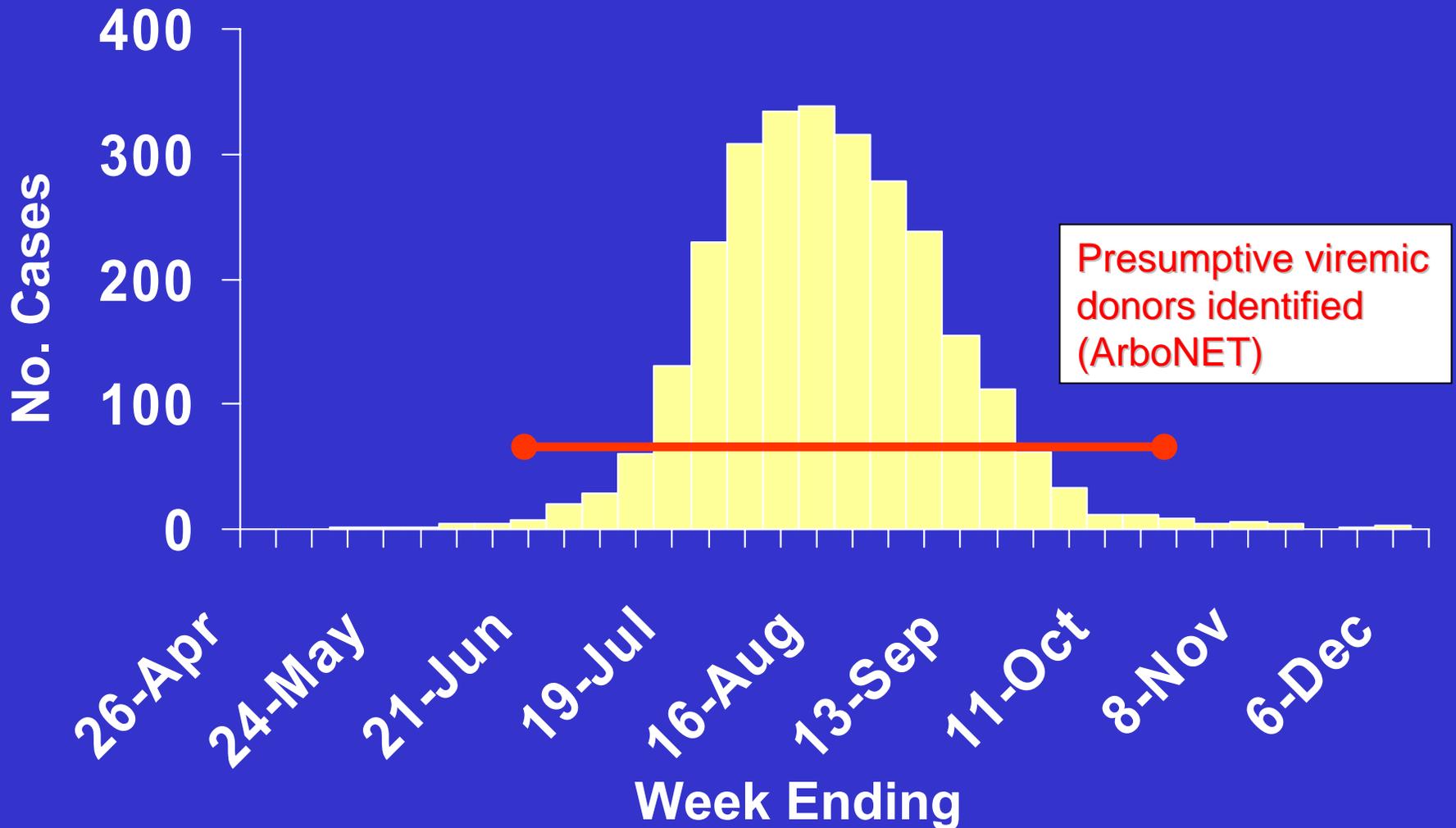
*Reported as of 1 / 20 / 2004

PVDs by Week of Donation, 2003*



* 806 PVDs reported to ArboNET as of 1 / 29 / 2004

WNND Cases by Onset Week, 2003*



* 2,709 cases reported as of 1 / 23 / 2004

PVDs as Potential Sentinel Events

- **PVDs: asymptomatic infections**
 - ~80% of WNV infections remain asymptomatic
 - Illnesses detected before symptom development
- **Blood bank testing is “real-time” and “free” (to state health departments)**
- **From ArboNET, 2003:**
 - 737 counties reported WNND cases and PVDs
 - 83 (11 %) counties PVD date of donation preceded WNND date of onset
 - Median difference 13 days (range, 1 – 86 days)

Blood Supply Safety in the Context of IND WNV Blood Screening

- **More than 1,000 infectious donations interdicted**
- **Sensitivity of IND WNV blood screening evaluated by investigation of suspect WNV TAT cases during 2003**
- **Investigations involved blood banks, FDA, CDC, and state and local health departments**

WNV TAT Cases, 2003

Two sources of investigations:

- 1. Public health investigations of WNV illnesses in transfusion recipients**
- 2. Individual testing of archived samples by blood collection agencies in selected areas**

Case Definitions for WNV TAT

Probable case:

- WNV RNA in index donation sample
- WNV-specific IgM in donor sample
- Confirmed WNV infection in recipient

Confirmed case:

- Probable plus one or more of the following:
 - No recipient mosquito exposure in 14d before illness onset
 - Pre- / post-transfusion samples available
 - Co-component recipient who is confirmed or probable case of WNV illness

Case Definitions for WNV TAT

Non-case:

- No WNV-specific IgM detected in recipient ≥ 4 weeks after transfusion
- No WNV RNA in index donation
- No WNV-specific IgM in donor samples (index or follow-up)

Inconclusive case: inadequate samples available to determine case status

WNV TAT Cases, 2003

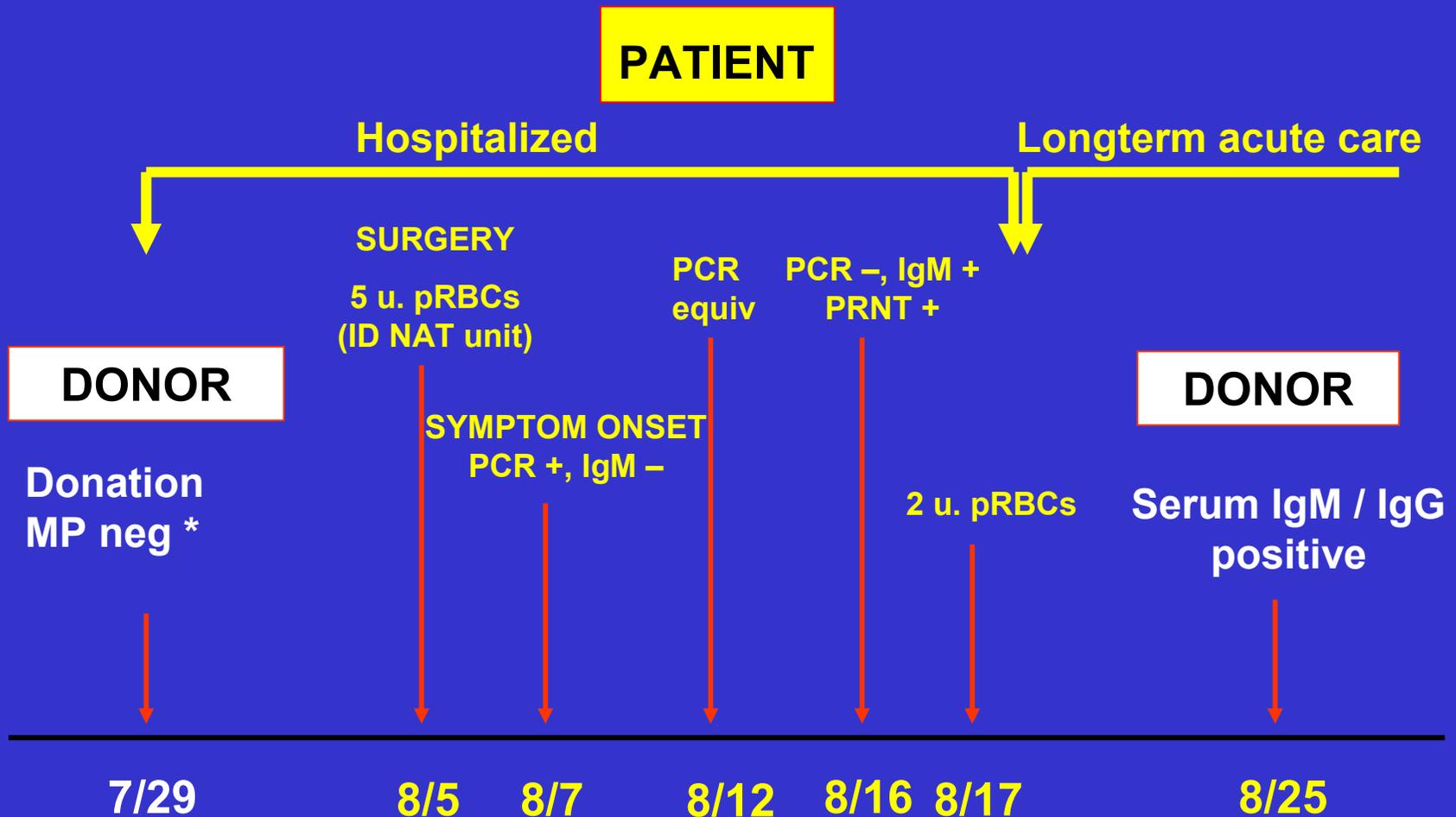
23 case investigations initiated

- **6 probable / confirmed cases**
- **10 non-cases**
- **2 inconclusive**
- **5 open investigations**

WNV TAT Confirmed / Probable Cases, 2003

- **Aortic graft surgery patient, Texas
MMWR, 9 / 26 / 2003**
- **By-pass surgery patient, Nebraska
MMWR, 9 / 26 / 2003**
- **Complications of aortic graft surgery patient,
Texas**
- **Motor vehicle accident victim, Iowa**
- **Myelodysplastic syndrome patient, Texas**
- **Aortic valve replacement / by-pass surgery
patient, Kansas**

Texas aortic graft surgery patient, 71 yo man 7 units, 7 donors, donated July 23 – August 7



* Individual sample repeat reactive in retrospective study

WNV TAT Confirmed / Probable Cases, 2003

- Illness onsets between August 7 – October 1**
- Median 7 donations transfused
(range 2—154 donations)**
- Recipient median age 63 years
(range 13 – 82 years)**
- Five of six recipients developed
WNV encephalitis
(one case did not have WNV illness)**

WNV TAT Confirmed / Probable Cases, 2003

- Viremia level for four infectious donations
median: 0.11 pfu/mL (range 0.06 – 0.50 pfu/mL)
 - (2002 range of viremia level for infectious donations: 0.8 – 75.1 pfu/ml)

- Insufficient sample available for two cases

WNV, Blood, and Surveillance

- **Future epidemics, continued blood screening**
Expanding to other flavivirus infections,
e.g. dengue
- **WNV viremic blood donor reporting as**
possible sentinel event

WNV and Safety of the Blood Supply

- **WNV blood screening success**
 - Rapid implementation
 - More than 1,000 possible infections prevented
- **2003 WNV TAT infectious donation viremia level much lower than 2002 cases**
- **Screening test changes?**
 - Sensitivity
 - Format
 - Sample preparation

Acknowledgements

CDC / DVVID

Tony Marfin
Lyle Petersen
Rob Lanciotti
Amy Lambert
Amanda Noga
Olga Kosoy
Roselyn Hochbein
Denise Martin
Nick Crall
Matt Kuehnert, DVRD
Mary Chamberland, DVRD
Lisa Pealer, EPO
Jen Brown
All the ArboNET staff

Blood bank community partners

Celso Bianco
Mike Busch
Sally Caglioti
Roger Dodd
Steve Kleinman
Jeff Linnen
Larry Pietrelli
Sue Stramer
Mike Strong
Many others from AABB, ABC, ARC, BSL
Many individual blood banks

Armed Services Blood Program

FDA

Hira Nakhasi
Jay Epstein
Jesse Goodman

Many state and local health departments